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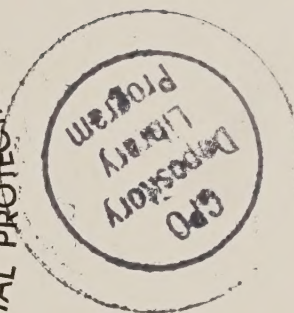United States
Department of
Agriculture

Forest Service

Summary Report

Forest Health Monitoring
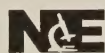
New England/Mid-Atlantic
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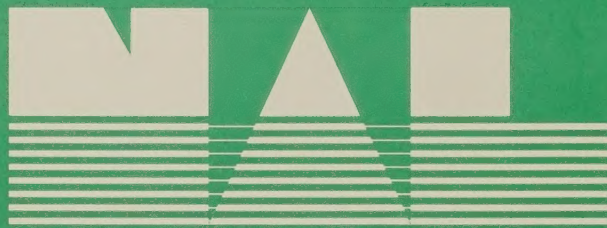──Forest Health Monitoring: A Partnership Between──
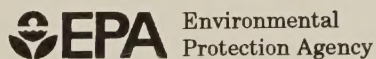
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Acknowledgements

Summary Report

Forest Health Monitoring
in the Northeast
1991

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Forest Health Monitoring: A Partnership Between

National Association of State Foresters
U.S. Environmental Protection Agency
and USDA Forest Service

Forest Health Monitoring
in the Northeast

Introduction

Forests cover a large portion of the landscape in the Northeast. They provide important renewable resources, recreational opportunities, habitat for wildlife, and aesthetic benefits, and protect and enhance water quality in the region. Concern about the condition and health of these forests has increased during the past decade. This concern is based on the documented and potential effects of air pollution, global climate change, and the interaction of these stresses with insects and pathogens.

The Forest Health Monitoring Program (FHM) was initiated in 1990 to address these concerns through the long-term, systematic collection of scientifically sound information on the condition of forests. The national program is jointly administered by the USDA Forest Service and the Environmental Protection Agency's (EPA) Environmental Monitoring and Assessment Program (EMAP), and includes the active participation of State Foresters and other Federal and state agencies. The objectives of the program are to:

1. Estimate the current status, extent, changes, and trends in the condition of forests with known confidence.

2. Monitor indicators of forest tree and ecosystem condition and identify associations between natural and human-caused stresses and ecological condition.

3. Provide periodic statistical summaries and interpretative reports on the ecological status and trends to resource managers and the public.

The FHM program in the Northeast is being implemented in the six New England States (Maine, Vermont, New Hampshire, Massachusetts, Connecticut, and Rhode Island) and three Mid-Atlantic States (New Jersey, Maryland, and Delaware).

Forest health is a term that describes the resilience and productivity of forest ecosystems relative to public values, needs, and expectations. Because any definition of a healthy forest is based on the values of the observer as well as the management objectives of the landowner or resource manager, it is difficult to set specific standards. However, the distribution of plots and the array of indicators of tree health used in FHM activities are providing the foundation for assessments of forest ecosystem health.

Monitoring is the repeated recording of pertinent data over time for comparison with a reference system or identified baseline. These early years of FHM activities allow the evaluation of current status and will provide the baseline with which to evaluate change and trends in forest condition.

FHM is organized into three complementary components. The first, **Detection Monitoring**, comprises: (1) a system of permanent ground plots assessed annually, and (2) irregular aerial surveys of forest pest and other stressor effects. The second component, **Evaluation Monitoring**, consists of more intensive and specific assessments of unexplained changes in forest condition identified by Detection Monitoring and, if possible, identification of the cause(s) or development of hypotheses which can be tested through research. The third component, **Intensive Site Ecosystem Monitoring**, is a small network of sites chosen to represent important forest ecosystems. The network is designed to provide a more complete understanding of the processes that are involved in regulating the function and controlling the structure of forest ecosystems.

This report summarizes 1991 results from Detection Monitoring activities in the nine northeastern states that are part of the FHM program.

1991 Activities

The national FHM program was expanded in 1991 with Detection Monitoring being conducted in 12 states. The six New England States that were included in 1990 were continued; FHM also was initiated in three Mid-Atlantic States (New Jersey, Delaware, and Maryland) and three Southern States (Virginia, Georgia, and Alabama). Pilot studies focusing on logistical planning and research on monitoring techniques were conducted in California, Colorado, and Georgia.

Permanent plot locations are based on a systematic sampling grid developed by the EPA-EMAP and is tied to the forest sampling system used by the USDA Forest Service's Forest Inventory and Analysis (FIA) unit. This approach is designed to provide a statistically valid sample of all land categories in the Nation and throughout a region. An FHM plot is made up of a cluster of four 1/24-acre subplots.

At the time of plot establishment, all trees on each subplot with a diameter at breast height (d.b.h.) ≥ 5.0 inches were identified by species, measured for d.b.h., and assessed for measures of crown condition including crown ratio, foliage transparency, crown dieback, crown density, and tree damage. Similar data were collected for saplings ($1.0 \leq$ d.b.h. < 5.0 inches) on a smaller microplot located within each subplot. Seedlings (< 1.0 inch d.b.h. and > 12 inches tall) were tallied by species on the microplot and assigned an overall condition class. On each plot, site-characterization data were collected for elevation, slope steepness, and slope direction. Condition of trees, saplings, and seedlings are evaluated annually; d.b.h. is measured every 4 years.

Characteristics of Forest Health Monitoring in 1991

Item	Mid-Atlantic	New England
Plots	75	250
Forested	30	199
Nonforested	45	51
Trees (5.0+ d.b.h.)	729	5,802
Dominant/Codominant	477	4,356

This report highlights results of the evaluation of indicators of crown vigor that are important in determining tree health. These include foliage transparency, crown dieback, and crown density. Field measurements are based on estimates of trained observers. Data on the dimensions of the crown and observations of damage provide additional characterization of the tree and collectively constitute an efficient estimate of the vigor and expected growth of each tree.

Foliage transparency, an estimate of the amount of skylight visible through the tree crown, is an indicator of the amount of foliage in a crown. The amount of foliage transparency differs by species and depends on the branching pattern plus the type and orientation of leaves. Foliage transparency serves as an estimator of defoliation caused by insect damage, pathogens, or environmental stress.

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Crown dieback is defined as recent branch mortality that begins at the terminal portion of branches and proceeds toward the trunk. Dead branches in the center and lower crown or below the live crown are assumed to have died from competition or shading and are not included. Crown dieback is caused by severe stress, frequently to the root system of the tree, though some species exhibit light levels of dieback as part of their normal growth and development.

Crown density represents the amount of foliage, reproductive structures (e.g., seeds or cones), and branches that obstruct skylight visibility through the crown. A normal, healthy, forest-grown tree is used as the standard. A dead top is included but dead lower branches are excluded. Estimates of low crown density have been correlated with reduced tree growth for several species.

1991 Results–
New England Region

Adjustments from 1990

FHM activities in New England in 1991 consisted of visiting each forested plot and evaluating the crown condition of each tree that was tallied in 1990. At the time of plot establishment in 1990, if one or more of the subplots differed from the center subplot with respect to forest type group, that subplot was "rotated" into the same forest type as the center subplot; that is, the subplot was moved in systematic manner so that all subplots were located in the same forest type. This procedure was reevaluated and determined to be inappropriate. Consequently, 24 subplots that were rotated in 1990 were dropped from FHM and replaced with data from the original "unrotated" location in 1991. This resulted in a slightly different number of sample trees in 1991 compared to 1990. Technical problems with the field-data recorders resulted in the loss of data from 3 plots in New Hampshire, 4-1/4 plots in Vermont, and 6 plots in Massachusetts. This also reduced the sample size in 1991 compared to 1990. The cause of this problem has been identified and corrected for 1992.

Information for New England on the distribution of plots by major forest type and state and the number of trees for major species and tree-size class was presented in the Summary Report for 1990 (Brooks et al. 1991).

Foliage transparency, crown dieback, and tree damage were evaluated by using the same procedures used in 1990. Slight modifications were made in the definition of live crown ratio from that used in 1990, resulting in a change in field procedures. Crown density and crown width were added as new measurements in 1991. Foliage discoloration for all species and needle retention for conifers were dropped because these data were determined to be of limited biological value given the constraints associated with estimating these subtle characteristics high in the crown from the ground. Proper evaluation of these two parameters requires the destructive sampling of a representative number of branches from each tree. It was decided that the information gained through destructive sampling was not worth the damage to the trees and the time required to collect samples.

Tree Crown Ratings

Foliage Transparency

There was minimal change in overall foliage transparency throughout New England from 1990 to 1991. Almost 95 percent of the open-grown, dominant and codominant trees ≥ 5.0 inches in d.b.h. were classified as having normal (≤ 30 percent) foliage transparency in 1991; the 1990 value was 96 percent. Only northern white-cedar showed a noticeable reduction (7.6 percent) in the number of trees classified as normal in 1991 compared to 1990. American beech and northern white-cedar were the only species with less than 90 percent of the sampled trees classified as normal.

Distribution of open-grown, dominant and codominant trees of major species on FHM plots in New England, by foliage-transparency class, 1991

Species	Sample size	Foliage-transparency class		
		Normal (0-30%)	Moderate (31-50%)	Severe (51+%)
	Number	--------*Percent of sampled trees*--------		
All species	4,356	93.8	4.4	1.8
Softwoods	1,754	94.6	4.8	0.6
Hardwoods	2,602	93.3	4.0	2.7
Balsam fir	361	97.7	2.0	0.3
Red spruce	456	99.6	0.4	0.0
Eastern white pine	445	92.1	6.8	1.1
Northern white-cedar	217	84.3	15.2	0.5
Eastern hemlock	169	93.5	5.3	1.2
Red maple	800	94.4	4.4	1.2
Sugar maple	342	98.8	0.6	0.6
Yellow birch	206	97.5	1.5	1.0
Paper birch	290	94.5	4.8	0.7
American beech	167	88.0	6.0	6.0
White ash	140	97.2	1.4	1.4
Northern red oak	168	90.4	6.0	3.6

Crown Density

Crown density was added as a new indicator of tree health in 1991. Crown shapes and the factors that influence crown shape and density are highly variable. Crown density is influenced by competition from neighboring trees, broken or damaged branches, poor overall growth of the tree, or reduced foliage due to factors such as poor growth or defoliation. Any of these factors, either alone or in combination, can result in the crown occupying less than the optimal space and hence a lower crown-density rating. Because of this high variability, broad crown-density groupings are used to indicate good, average, or poor conditions.

Nearly 97 percent of overstory trees were evaluated as having good or average crown densities in New England. Hardwoods had a slightly higher percentage of trees classified as average or poor than softwoods. Two species with less favorable foliage-transparency ratings than the others, northern white-cedar and American beech, also had less favorable crown-density ratings. Loss of foliage will result in lower foliage-transparency ratings and is one of several factors that can influence crown density.

Distribution of open-grown, dominant, and codominant trees of major species on FHM plots in New England, by crown-density class, 1991

Species	Sample size	Crown-density class		
		Good (51+%)	Average (21-50%)	Poor (1-20%)
	Number	*-----Percent of sampled trees-----*		
All species	4,356	56.8	40.4	2.8
Softwoods	1,754	59.9	38.3	1.8
Hardwoods	2,602	54.8	41.7	3.4
Balsam fir	361	64.3	33.2	2.5
Red spruce	456	68.8	30.3	0.9
Eastern white pine	445	56.0	42.2	1.8
Northern white-cedar	217	47.0	49.8	3.2
Eastern hemlock	169	49.1	50.9	0.0
Red maple	800	54.2	44.0	1.8
Sugar maple	342	68.4	30.4	1.2
Yellow birch	206	67.9	30.6	1.5
Paper birch	290	66.6	31.7	1.7
American beech	167	52.1	40.7	7.2
White ash	140	57.1	40.7	2.1
Northern red oak	168	33.3	64.3	2.4

Crown Dieback

About 97 percent of the open-grown, dominant and codominant trees evaluated on FHM plots in New England in 1991 were classified as having no or light crown dieback. This percentage is nearly the same as that recorded the previous year. Another similarity between 1990 and 1991 was the tendency for hardwoods to have more crown dieback than softwoods. In paper birch, white ash, and American beech, 5 percent or more of the trees had moderate or severe crown dieback. In 1990, northern white-cedar, American beech, and red maple had 5 percent or more trees in these categories.

Distribution of open-grown, dominant and codominant trees of major species on FHM plots in New England, by crown-dieback class, 1991

Species	Sample size	Crown-dieback class			
		None (0-5%)	Light (6-20%)	Moderate (21-50%)	Severe (51+%)
	Number	--------*Percent of sampled trees*--------			
All species	4,356	84.3	12.6	2.0	1.1
Softwoods	1,754	93.3	5.5	0.6	0.6
Hardwoods	2,602	78.4	17.3	2.9	1.4
Balsam fir	361	92.2	6.4	0.6	0.8
Red spruce	456	97.8	2.0	0.0	0.2
Eastern white pine	445	94.9	4.9	0.2	0.0
Northern white-cedar	217	83.8	12.0	2.8	1.4
Eastern hemlock	169	91.7	6.5	1.2	0.6
Red maple	800	77.3	19.2	2.5	1.0
Sugar maple	342	88.6	9.6	1.2	0.6
Yellow birch	206	87.3	11.2	1.0	0.5
Paper birch	290	78.6	15.2	4.1	2.1
American beech	167	73.0	16.8	3.6	6.6
White ash	140	80.0	15.0	4.3	0.7
Northern red oak	168	71.4	26.8	1.8	0.0

1991 Results– Mid-Atlantic Region

Distribution Sample

The distribution of FHM plots between forested and nonforested areas reflects the reduced forest area throughout New Jersey, Delaware, and Maryland compared to New England. Forty percent of the area sampled by the plots was in forests, This corresponds to the amount of forest land as a percent of total land area from recent intensive surveys by the Forest Service's FIA unit that showed New Jersey as 43 percent forested and Delaware and Maryland as 33 and 42 percent forested, respectively.

Distribution of area sampled by forest-type group and state, Mid-Atlantic Region, 1991

Forest-type group	Delaware	Maryland	New Jersey	All states
Eastern white pine	0.0	0.0	1.8	1.8
Loblolly/shortleaf pine	0.0	0.7	3.3	4.0
Oak/pine	0.0	1.4	1.5	2.9
Oak/hickory	0.3	8.3	2.8	11.4
Oak/gum/cypress	0.9	1.7	1.1	3.7
Northern hardwoods	0.0	1.3	2.9	4.1
Miscellaneous	0.0	1.1	1.0	2.1
All groups	**1.2**	**14.5**	**14.2**	**30.0**
Nonforest	6.8	22.5	15.0	44.3
Unsafe conditions	0.0	0.0	0.8	0.8
All plots	**8.0**	**37.0**	**30.0**	**75.0**

In all, 52 species, 8 softwoods and 44 hardwoods were tallied. Six of the hardwoods occurred only as seedlings or saplings. The number of species in the FHM sample is less than the number tallied in the more intensive FIA survey of these states–85 species, including 18 softwoods and 67 hardwoods.

Number of trees of major species on FHM plots in New Jersey, Delaware, and Maryland, by tree class

Species	Seedlings-saplings	Mature trees		All classes
		Live	Dead	
Pitch pine	19	93	1	113
Loblolly pine	7	43	4	54
Other softwoods	1	34	0	35
All softwoods	**27**	**170**	**5**	**202**
Red maple	91	100	2	193
Sweetgum	72	56	0	128
Black cherry	44	35	0	79
White oaks	55	92	7	154
Red oaks	186	81	4	271
Other hardwoods	285	195	25	505
All hardwoods	**733**	**559**	**38**	**1,330**
All species	**760**	**729**	**43**	**1,532**

Tree- Crown Ratings

Foliage Transparency

More than 98 percent of the upper canopy trees were classified as having normal foliage transparency. Only one of the major forest species, pitch pine, had less than 100 percent of the sample trees rated as normal: three trees were classified as moderate and three as severe. These overall "healthy" ratings for the FHM plots in New Jersey, Delaware, and Maryland will provide the baseline with which to evaluate future trends in foliage transparency.

Distribution of open-grown, dominant and codominant trees of major species on FHM plots in New Jersey, Delaware, and Maryland by foliage-transparency class, 1991.

Species	Sample size	Foliage-transparency class		
		Normal (0-30%)	Moderate (31-50%)	Severe (51+%)
	Number	--------*Percent of sampled trees*--------		
All species	477	98.5	0.8	0.7
Softwoods	126	95.2	2.4	2.4
Hardwoods	351	99.7	0.3	0.0
Pitch pine	65	90.8	4.6	4.6
Loblolly pine	34	100.0	0.0	0.0
Red maple	53	100.0	0.0	0.0
Sweetgum	31	100.0	0.0	0.0
Black cherry	25	100.0	0.0	0.0
White oaks	62	100.0	0.0	0.0
Red oaks	62	100.0	0.0	0.0

Crown Density

Virtually all of the FHM trees were classified as having good or average crown densities, with 72 percent rated as good and 27 percent as average. In general, softwoods had more trees classified as good than hardwoods. Sweetgum was the only species with individuals evaluated as having poor crown densities. These results indicate that trees growing in FHM plots are well within the range of normal conditions with respect to crown density. Future measurements of tree growth will provide data with which to conduct in-depth analyses of the relationship between crown density and growth.

Distribution of open-grown, dominant and codominant trees of major species on FHM plots in New Jersey, Delaware, and Maryland, 1991

Species	Sample size	Crown-density class		
		Good (51+%)	Average (21-50%)	Poor (1-20%)
	Number	—*Percent of sampled trees*—		
All species	477	72.6	26.6	0.8
Softwoods	126	83.3	16.7	0.0
Hardwoods	351	68.7	30.2	1.1
Pitch pine	65	84.6	15.4	0.0
Loblolly pine	34	70.6	29.4	0.0
Red maple	53	77.4	22.6	0.0
Sweetgum	31	64.5	32.3	3.2
Black cherry	25	96.0	4.0	0.0
White oaks	62	64.5	35.5	0.0
Red oaks	62	67.7	32.3	0.0

Crown Dieback

Virtually all (99.4 percent) of the overstory trees tallied in New Jersey, Delaware, and Maryland were classified as having either no or light crown dieback. There was a higher percentage of trees rated as having light crown dieback than in New England. However, only 7 percent of the trees were rated in the 11-20 percent section of this category. Thus, 92.4 percent of the trees had 0-10 percent crown dieback.

Distribution of open-grown, dominant and codominant trees of major species on FHM plots in New Jersey, Delaware, and Maryland, grown by crown-dieback class, 1991

Species	Sample size	Crown-dieback class			
		None (0-5%)	Light (6-20%)	Moderate (21-50%)	Severe (51+%)
	Number	--------Percent of sampled trees--------			
All species	477	72.4	27.0	0.6	0.0
Softwoods	126	78.6	20.6	0.8	0.0
Hardwoods	351	70.1	29.3	0.6	0.0
Pitch pine	65	69.2	30.8	0.0	0.0
Loblolly pine	34	94.2	2.9	2.9	0.0
Red maple	53	84.9	15.1	0.0	0.0
Sweetgum	31	80.6	19.4	0.0	0.0
Black cherry	25	40.0	60.0	0.0	0.0
White oaks	62	66.1	33.9	0.0	0.0
Red oaks	62	43.5	54.8	1.7	0.0

Summary of Crown Condition in 1991

The forests of the nine northeastern states covered by FHM in 1991 are in very good condition based on observations of the amount and distribution of foliage in tree crowns. Between 94 and 99 percent of the open-grown, dominant and codominant trees were rated as being in the "healthy" categories for the three descriptors of crown condition reported here. Annual evaluation of foliage transparency, crown dieback, and crown density provides an efficient estimate of the state of health of trees. These variables integrate the combined effects of a wide array of stressors; however, they do not provide information needed to determine the cause of poor condition. In some cases, observations of tree damage provides insight, for example, if there has been a recent, severe infestation of an insect which has resulted in estimates of high foliage transparency and low crown density.

In New England, there was essentially no change in the overall ratings from 1990, though there were small shifts for each of the major species. Only two species had foliage transparency ratings with less than 90 percent of the trees classified as normal. Northern white-cedar had a 7.6 percent decrease in the number of trees rated as having normal foliage transparency with no obvious causes. American beech showed a slight improvement from 1990 with 88 percent classified as normal. This species is known to be under stress throughout New England due to the effects of the beech bark disease complex.

Overall, crown-symptom ratings of the forests were somewhat better in the Mid-Atlantic States than in New England. Pitch pine was the only major species with less than 100 percent of the sample trees rated as normal for foliage transparency.

Status of Major Forest Insects and Pathogens in New England and Mid-Atlantic States in 1991

The following section reviews the status of major forest insects and pathogens in 1991 in the New England and Mid-Atlantic States. This information was compiled from state pest condition reports and surveys of the USDA Forest Service, Northeastern Area State and Private Forestry field offices in Durham, New Hampshire and Morgantown, West Virginia.

In general, insect and disease damage is not affecting extensive areas of the forest resource. Specific pests do not occur on all of the various FHM permanent plots. Nor do they occur within the full range of forest types within the northeastern region. Therefore, the distribution of the various insects and pathogens is not assessed through the permanent plot network. Rather, special aerial and ground surveys are conducted to determine the impact from a specific pest. In the Northeast, the distribution of the various pests is patchy except for some of the areas affected by defoliators. There does not appear to be any unusual or unexpected impact from forest damage agents.

Defoliators continue to have the greatest impact on the various forest types in New England and the Mid-Atlantic States. Beech bark disease continues to be one of the more significant diseases in the region. Damage from the disease can be found throughout New England and northern New Jersey, but the amount of tree crown dieback and mortality varies. Butternut canker is causing concern for the survival of that species as mortality continues in several areas. Dieback of maple is reported throughout the region, but in most cases less than 10 percent of the crown is affected and losses are insignificant.

Weather was another factor affecting various forest species. Hurricane Bob caused a significant amount of blowdown and damage from salt spray in coastal New England. Reports of localized drought effects and winter injury on conifers were reported in some states.

The **oak-hickory** forest-type group and to a lesser extent the **oak-pine** forest type group are still affected by extensive gypsy moth defoliation. Various species of oaks are affected, as are eastern white pine and northern hemlock in heavily infested areas. In 1991, 1,389,844 acres were defoliated in the nine-state region compared with 1,294,891 acres in 1990.

Acres of defoliation by gypsy moth in 1990 and 1991, by state

State	Acres defoliated		Percent change (1990 base)
	1990	1991	
	- - - - - - - - - - - Number - - - - - - - - - - -		
Connecticut	176,576	50,154	- 72%
Delaware	3,790	13,475	+ 256%
Massachusetts	83,595	282,143	+ 238%
Maryland	133,062	75,197	- 43%
Maine	270,433	614,509	+ 127%
New Hampshire	133,200	180,870	+ 36%
New Jersey	431,235	169,900	- 61%
Rhode Island	0	0	0%
Vermont	63,000	3,596	- 94%
Total	**1,294,891**	**1,389,844**	**+ 7%**

Although overall acreages were similar from 1990 to 1991, there were dramatic increases in the area of defoliation in Massachusetts, Maine, and Delaware, and decreases in Connecticut, Maryland, New Jersey, and Vermont. In many areas, mortality of gypsy moth larvae was significant due to fungal or viral infection. No significant defoliation has been reported in Rhode Island during the last several years. There were various other oak defoliators reported in 1991. Populations of the fall webworm were heavy in areas of Massachusetts, New Hampshire, and Vermont. Oak leaftier populations were down from previous years when heavy infestations caused oak mortality in eastern Massachusetts.

Various species of the **northern hardwood** forest-type group are affected by other defoliators such as the eastern tent caterpillar, forest tent caterpillar, pear thrips, and the saddled prominent. Populations of these insects were at low levels in 1991 in the nine states.

The **aspen-birch** forest-type group was affected primarily by defoliators including the birch casebearer, leafminers, and skeletonizer. Birch dieback is reported from Vermont and especially Maine, where several areas in the western and eastern parts of the state are affected.

The **elm-ash** forest-type group is affected primarily by diseases. Ash dieback, commonly associated with ash yellows, caused mortality in Maine, Vermont, and Massachusetts. Dutch elm disease is common throughout the states as a new, more virulent strain is spreading.

There are several major pests of the **spruce-fir** forest type group, which includes eastern larch. Spruce budworm populations continue at low levels in northern New England, with no noticeable defoliation in the last several years. In Maine, a disease known as Stillwell's syndrome, associated with *Armillaria* root disease, continues to cause low levels of mortality in balsam fir stands over an extensive area previously defoliated by the spruce budworm. The spruce beetle is causing mortality of larger spruce in northern Maine, and the area of infestation is increasing in size and intensity. This insect also is causing spruce mortality at other sites in northern New England. Spruce dieback continues to be reported, with the problem most noticeable at higher elevations. The balsam woolly adelgid is causing damage to balsam fir crowns at scattered sites in northern New England. Larch mortality, usually in association with the eastern larch beetle, is occurring in Vermont and Maine. The European larch canker occurs along coastal Maine and is currently under quarantine.

The **white and red pine** forest-type group, which includes eastern hemlock, is affected by several diseases, defoliators, and stem and twig insects. The hemlock looper is causing defoliation at various sites in New England. This pest is of concern in the affected states due to the incidence of tree mortality. Damage from the hemlock woolly adelgid and red pine adelgid continues in Connecticut and Rhode Island. These insects are expanding into Massachusetts, and the hemlock woolly adelgid has been found at one site in Vermont. This pest also is causing damage in New Jersey and Maryland. *Scleroderris* canker, on red pine in Vermont, is still under quarantine; however, the incidence of this disease is currently static.

The **pitch pine** forest type is concentrated in southern New Jersey, where the pitch pine looper is causing defoliation, and on Cape Cod in Massachusetts, where the Nantucket pine tip moth and pine needleminer occur. Defoliation and possibly increased mortality due to this insect in combination with drought in the New Jersey Pinelands could increase the threat of fire.

Summary

The objectives of the 1991 FHM field season in the Northeast were to: (1) expand the permanent plot network to include three Mid-Atlantic States; (2) correct problems encountered in the 1990 field season; and (3) collect second-year observations on crown-rating data for the six New England States. All of these objectives were met satisfactorily.

While it is too early to make reliable assessments of change, the 1991 data support the 1990 contention that there is no evidence of widespread decline (as evidenced by tree crown symptoms) in any tree species in the included states. Current plans are to continue monitoring the established plots and eventually add additional plots in other states so that we can continue to provide timely, accurate assessments of forest health in the Northeast.

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